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ABSTRACT

This paper addresses girls' patterns of computer avoidance at the middle school and other grade levels. It reviews the evidence for a gender gap in computer use in several areas: in school, at home, in computer camps, in computer magazines, and in computer-related jobs. It compares the computer equity issue to math avoidance, and cites the middle school years as a time when these become evident. Also provided is a description of the work of the federally-funded Computer Equity Training Project, conducted by the Women's Action Alliance, including its activities, conclusions on the causes of the gender gap, and the development of a book of strategies for teachers to counter girls' computer avoidance. Several conclusions are presented about the implementation of a computer equity program in a school, and implications for action and research by sex equity professionals are listed. (Author/JB)

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REFLECTIONS FROM THE COMPUTER EQUITY TRAINING PROJECT

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REFLECTIONS FROM THE COMPUTER EQUITY TRAINING PROJECT

By Jo Shuchat Sanders, Project Director

In October 1983, Women's Action Alliance began work on the Computer Equity Training Project to reverse girls' computer avoidance at the middle school level. The goal of the project is to develop, test, and publish a book for educators containing strategies they can use to establish or maintain girls' interest in using computers. (The project emphasizes optional computer use during the school day or after school: it is not terribly difficult to achieve a sex balance in a required course, assuming the student body is evenly divided by sex). We are funded for two years by a grant from the Women's Educational Equity Act Program, U.S. Department of Education.

This paper summarizes some of the evidence for a gender gap in computer use, describes the Computer Equity Training Project to date, and discusses several conclusions and implications we think are rather significant.

1. Evidence for the Computer Gender Gap

The Computer Gender Gap in Schools

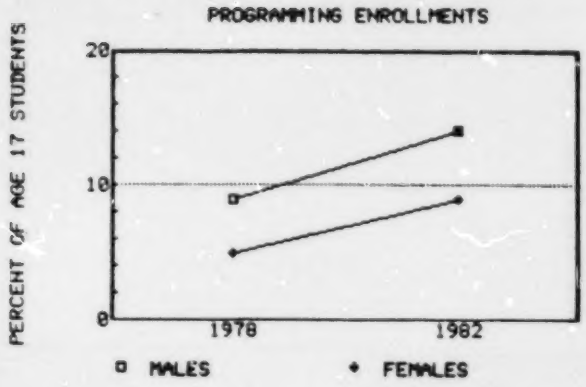
Evidence for a gender gap in computer use in schools consists of findings such as these:

- Marlaine Lockheed of the Educational Testing Service in Princeton found in 1982 that while 40% of the boys at Princeton High School said they used the computer during their free periods, only 8% of the girls said they did so. [1]

- EQUALS, a program that promotes math, science, and computer study for girls, reports that in a 1980-81 survey of computer electives, girls made up only 29% of the students enrolled. [2]

- The Project on Equal Education Rights tells of surveys conducted in California, Maryland, and Michigan on enrollment in high school programming courses by sex. The results were remarkably similar: 37.5%, 35.9%, and 36.0% of the students in these states respectively were female, nearly a 2:1 ratio. [3]

- The 1981-82 National Assessment in Science found that the computer gender gap remained constant between 1978 and 1982 for 17-year-olds who enrolled in programming courses [4]:



- Of the computer and information science degrees awarded in 1981, women earned 32% of the bachelor's degrees, 23% of the masters, and 10% of the doctorates. This is the greatest decline from bachelor's to doctorate of any field except law.

- In our Computer Equity Training Project pilot test in the spring of 1984, records on optional computer use before we began to work with the three junior high/middle schools indicated that nearly four-fifths (78%) of the students who took advantage of free-time computer opportunities were boys.

- In our field test schools this spring, initial records showed that from two-thirds to four-fifths of the free-time computer users were boys.

In addition to these indications, Albuquerque Public Schools has just released the first of three planned evaluations of their city-wide computer education program. [5] Evidence of a computer gender gap is widespread. Among the findings for grades K-12 are the following:

- 82% of the boys and 77% of the girls said they had played computer games.

- 46% of the boys and 32% of the girls said they had written a computer program.

- 24% of the boys and 19% of the girls said they have learned about computers in classes taught outside of school.

- 45% of the boys and 39% of the girls said they had taken a computer course of some kind.

- 37% of the boys and 20% of the girls said they taught themselves how to use a computer.

As report coordinator and editor Jennifer John wrote to us when she sent the report, "I hope this will help you convince people that there is indeed a problem with availability of computers to girls."

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The Computer Gender Gap at Home

There has been less published on this subject than in the school arena. What there is, however, echoes the school results.

- The Albuquerque evaluation found that 39 percent of the male students and 25.3 percent of the female students reported having a computer at home. In an especially interesting finding concerning students' knowledge of parents' work use of computers, the report states: "Girls were significantly less knowledgeable about whether adult males in their home use a computer at work than were boys." [6]

- Irene Miura and Robert Hess of Stanford University reported in a 1983 paper that twice as many boys as girls used their home computers, and that the boys used them for longer periods of time than the girls. [7]

- Our Computer Equity Training Project conducted a survey last year on home computer ownership and use in our three pilot test schools. Thirty-seven percent of the 7th and 8th grade boys reported having a computer at home, whereas only 28 percent of the girls did. Furthermore, boys were more than three times as likely to say they used the computer more than anyone else in the house. Both sexes agreed that males -- boys and fathers -- used the home computers more than girls and mothers. [8]

The Computer Gender Gap in Summer Camps

Miura and Hess (ibid.) reported in their 1983 paper on the results of a survey of directors of summer computer camps. The 23 directors who responded said that girls constituted 30% of the primary grade computer campers, 26% of the middle school campers, and 24% of the high school campers. They also found that female enrollment declined as the difficulty of the computer curriculum increased, and declined as well as the camp became more expensive.

The Computer Gender Gap in Computer Magazines

We recently analzyed four recent issues of large-circulation computer magazines for their portrayals of males and females. We counted 178 photographs of people in Compute!, Personal Computing, Info World, and Popular Computing. Thirty-six percent of the photos showed females in passive computer use -- watching other people use computers or demonstrate computer products. Only 17 percent showed women or girls actively using computers or demonstrating computer products. [9] It is difficult to say whether the slant in favor of males (nearly all of whom were White, by the way) mirrors reality, creates it, or both.

In 1982, the Director of Educational Marketing for Apple Computer was quoted in Business Week as saying, "The buyers of Apple computers are 98% male. We do not feel that women represent any great untapped market." Looking at today's computer magazines and advertisements, there hasn't been any great change.

The Gender Gap in Computer-Related Jobs

As U.S. Department of Labor statistics on job classifications show, relatively few women now hold jobs directly involving computers:

Computer Occupations and Earnings [10]

OCCUPATION	1982 ANNUAL EARNINGS	PERCENT FEMALE
Other computer specialists	$ 31,772	16 %
Electrical and electronic engineers	31,148	4
Systems analysts	28,028	26
Operations and systems research analysts	26,416	31
Programmers	23,088	32
Electrical and electronic engineering technicians	20,800	12

Considering that women are working now to support themselves and their families -- 68% of mothers with children aged 6-17 are in the work force -- and considering that nine out of ten girls now in high school will work for pay for nearly 30 of their adult years, the underrepresentation of girls in computer activities in school, home, and camp will guarantee a continuation of the imbalanced employment figures above. Girls who choose to avoid a computer now may well be forced to avoid a well-paying job later on. The time to devote effort to reversing the computer gender gap is now.

* * *

While it is true that the computer equity issue is relatively new, most of the available evidence points to the middle school age as the time when the computer gender gap first becomes noticeable, much the same as the math avoidance pattern we have come to understand. With the onset of adolescence, girls begin to come to grips with what it means to be a female in American society. Behavior, attitudes, and skills that society deems more appropriate for one sex find rigid expression at adolescence, an age whose superficial notions of sex-appropriateness permits little flexibility. For related reasons, the strength of peer pressure is at an all-time high among young teenagers, and it serves to enforce sex-role orthodoxy.

We chose to focus on the middle school in our Computer Equity Training Project in an attempt to close the computer gender gap before it has a chance to widen even further in high school and beyond. Events have borne out the choice: while there are occasional reports of aggressive elementary school boys pushing girls off the chairs at the computer, by and large the problem becomes more evident in junior high school.

2. The Alliance's Computer Equity Training Project

In the first year, we conducted a literature review and compiled a list of all the causes of the computer equity problem we could find. At that time, there was little in the way of hard proof, with writers often quoting each other's suspicions. Augmented by theories of classroom teachers, our "speculation" list of about 30 possible causes of the computer equity problem was published in April 1984. [11]

We have now identified several of them as nearly certain and several others as probable. [12] Those that are nearly certain are:

- The chicken-and-egg pattern -- girls consider computers unfeminine because they see mostly boys using them.
- Girls stay out of the computer room because their girlfriends aren't there, an important social dynamic particularly at the middle school age.
- Schools often make computers available for optional use on a first-come, first-served basis, and boys, in their enthusiasm for the computer, aggressively capture the opportunities.
- Most girls find Logo an interesting computer language, but most schools teach BASIC.
- One student per computer, the usual school arrangement, doesn't meet adolescent girls' needs for social interaction.
- Faculty members fail to provide active encouragement to girls in using computers.

Probable causes of the computer gender gap are those that may well be borne out by further research, but which have not yet been established. They include:

- Computers may be identified in girls' minds with mathematics, and we already know that math has a male association.
- Girls seem to prefer purposeful activities, and many computer activities involve pointless game playing and random exploration of the computer's capabilities.
- The violence and conflict on which most recreational (and some educational) software is based may repel girls -- and some boys, too, for that matter.
- Parents may structure their daughters' free time more closely than their sons', either to protect them or to make sure they have time for household chores, with the result that girls have less opportunity for informal after-school computer use than boys.

- Some teachers and parents may accept the stereotypical notion that computers are more suitable for boys than girls, and convey the message to children.

To develop strategies to reverse girls' computer avoidance, we chose three middle or junior high schools as pilot test sites in the spring of 1984:

- Franklin Junior High School, Whitewater, Wisconsin: a small university town with a primarily white population.

- Waldport Junior High School, Waldport, Oregon: a fishing and logging village on the coast with a primarily white population.

- Mt. Hebron Middle School, Upper Montclair, New Jersey: a New York metropolitan suburban town with a 52% black population.

Among them, the pilot test schools implemented strategies that included separate days for girls and boys in the computer lab, the substitution of Logo for BASIC in the introductory computer course, parent involvement activities, computer graphics, a girls' leadership group for computer equity, and others. It was from the pilot test experience that we were able to draw the conclusions mentioned above about the causes of the computer equity problem. These schools increased girls' computer use by at least 40 percent over the course of the term.

In the summer and fall of 1984, we drafted The Neuter Computer: Why and How to Encourage Computer Equity for Girls. The book contains background information on the computer equity problem, a chapter on planning a computer equity program in a school, 66 strategies for increasing girls' computer use, a chapter on additional resources, and a glossary of technical terms. It will be revised this summer and published in September.

To field test The Neuter Computer, we have a research design that calls for three experimental schools, an attention control school, and a pure control school. Data collection consists of pre- and post-tests for the faculty and 7th and 8th grade students, daily records on optional computer use, and biweekly phone conferences for all but the pure control school. The experimental schools are:

Alfred Nobel Junior High School, Northridge (Los Angeles), California: an urban school with 45% minority students of whom most are black and some are Hispanic.

Gering Junior High School, Gering, Nebraska: a small town with 15% minority students of whom most are black and some Hispanic.

Camel's Hump Middle School, Richmond, Vermont: a rural village with a primarily white population.

The attention control school is Cumberland Middle School in Cumberland, Rhode Island, a semi-urban area with a preponderance of white students, many of whom are of Portuguese descent. The control school is Lamar at Trenton Middle School in McAllen, Texas, a small city on the Mexican border with a majority of Hispanic students.

The field test strategies being implemented include an afternoon minicourse in computer graphics, a Logo minicourse for girls, staff in-service in computer equity, training teachers (and from there, students) in word processing, separate days for girls and boys in the computer lab, parent activities, preparation of a manual on software to encourage greater computer use by teachers with their classes, enlisting girls and mothers as computer lab supervisors, producing a school newspaper on a word processor, and others.

3. Taking Stock of What We Have Learned

Although we obviously have not yet learned everything there is to know about computer equity in schools, some issues have surfaced that are of great importance to a realistic understanding of the helps and hindrances to achieving it. These lessons are:

1. The key to computer equity success in a school seems to be the willingness of the faculty to take active steps toware encouraging girls' computer use. They need to feel that computer use is valuable in and of itself, and to feel that a focus on girls is important and legitimate. With these attitudes, they can take such steps as:

   - o Offering computer activities that girls enjoy, such as word processing, Logo, graphics, and others, in class and after school.
   - o Encouraging social interaction among girls in the computer lab.
   - o Encouraging parents to influence their daughters' computer use.
   - o Arranging for formal or informal in-service training to acquire computer skills and/or extend their awareness of sex equity issues.

2. The computer gender gap is fairly invisible to faculty. The fact that their own computer teachers tell them about the gap doesn't seem to be enough. They begin to believe it only when they see a chart of their own students' computer usage, but they really believe it when they go look at the boy/girl situation in the computer lab with their own eyes.

3. Most teachers don't use computers in their classes. In the schools in which computer training has been offered, many still don't use computers with students, although they may use them for themselves. The non-computer-literate teachers are the most likely ones to say that if girls don't use computers it's because they're not interested, so why bother?

4. As a result of #3, school computers are very underutilized: how many computer literacy classes can be scheduled, after all? A principal with $50,000 worth of hardware and software is understandably nervous at seeing it unused. If a few boys show up to use the computers, the principal's reaction is one of relief, not concern.

5. The computer equity version of the general resistance to sex equity in education takes this form: "If we improve the computer program for everyone, then everyone's computer use will go up. Girls are half of everyone. Problem solved." It's not solved, though: the two lines indicating girls' and boys' computer use will move up on the chart, but the distance between them will remain.

Overall, it would appear that computer equity depends first on positive computer attitudes and second on positive equity attitudes. If teachers don't consider computer skills valuable, they can't really be expected to encourage girls to use computers. We find resentment among some teachers about computers: computers drain money and resources away from other pressing needs, computers are touted as all but replacing the fuddy-duddy old-fashioned teacher, and computer avoidance based on association with math and machines may affect female teachers (and some male teachers) as well as girls.

* * *

Computer equity, we have discovered, is very unlike other sex equity in education efforts that have been promoted over the past decade.

In the related sex equity areas of mathematics, science, and nontraditional job training, the basic issue is that these educational programs are not serving girls nearly as well as they are serving boys. The sex equity push in these programs has been to ensure that girls obtain their fair share of the benefits. In the case of computer education, however, few schools have an excellent program in place. As a result, indications that girls are underserved are much less obvious than in math, science, and vocational education. A second consequence of bare-minimum computer education programs is that it is difficult for teachers to become concerned about girls' lack of computer opportunities when boys are not terribly well served either.

Teachers and activists in moderate numbers have become convinced of the need to do something to improve girls' and women's prospects in math, science, and vocational education. Many of them no longer needed to learn why -- they just wanted to learn how. Publications and other resource materials on math, science, and nontraditional occupations for women have therefore found a reasonably ready audience. (For example, I wrote a book a few years ago called The Nuts and Bolts of NTO -- nontraditional occupations -- and have since found that nearly all of the many public and private sources of nontraditional job training for women that I learned about in the last few years have bought and used it.)

Computer Equity Awareness at the Local Level

The "market" for computer equity must still be created. In some of the schools we have visited or worked with, educators are concerned about the underutilization of their computer resources and feel that they should be doing more to enable the computers to be used. These teachers feel they ought to learn word processing and other applications, ought to find out about and learn how to use educational software with their students. They find the magnitude of the task overwhelming: too little time, too little familiarity with the educational computing field. When we arrived with The Neuter Computer, we represented a welcome opportunity for them to improve their computer program. Our primary problem in these schools was to keep their need to develop a quality computer education program from burying all attention to the computer equity issue.

In other schools, educators are wary about computers. They do not know how to use computers, and do not want to know. Perhaps they feel that computers are another passing fad, or are experiencing the backlash that comes in the wake of a hard sell, or are frustrated that other important educational needs are not being met. Perhaps they know so little about computers that they simply don't care. These teachers, with neutral or anti-computer attitudes, cannot be expected to become instant advocates for computer education for any students. And as few of them have a high level of sex equity awareness, they surely cannot be expected to encourage computer use specifically for girls.

It seems clear to us that much more needs to be done that simply publish and disseminate The Neuter Computer. The most aggressive dissemination will not be enough to overcome the anti-equity and anti-computer attitudes in our schools. Nevertheless, the time to reverse girls' computer avoidance is now. If we wait too long, the computer/male association will become so entrenched that solving the problem will be far more difficult.

Computer Equity Awareness at the State Level

There is more awareness of the need for computer equity action at the state and regional level than in local schools.

We participate in formal and informal networks of sex equity specialists throughout the country, consisting of state Title IV and Title IX personnel, state vocational education sex equity coordinators, regional Sex Desegregation Assistance Centers, researchers, and activists. Our impression is that most of these people know about the gender gap in computer use, perhaps because it parallels so closely the same gap in math and science.

While more of them are mentioning computer equity in their professional activities and scheduling sessions about it at meetings and conferences, they do not have the computer expertise they need to deal with the problem. Several specialists have begun to work cooperatively on the issue with their computer counterparts in state Departments of Education (this is primarily in states whose teams attended the Council of Chief State School Officers Institute last year), but most have not.

Similarly, we are in contact with state-level computer coordinators, educational technology laboratory personnel, software developers, and computer education researchers. They, too, are aware of the equity dimension of computer education, but they are generally too involved in helping schools establish good computer programs and too unaware of the need for sex equity efforts to be able to do much about computer equity for girls.

This situation is not surprising. First of all, although computer equity is essentially an amalgam of computer education and sex equity, each of which is a professional field with substantial experience and expertise, the combination is a new issue. The fact that computers have only been in schools for a few years means that the gender gap is only now becoming noticeable to many observers. Secondly, it is not unreasonable that computer specialists are not equally knowledgeable about sex equity, and vice versa.

As a result, there are very few people in the United States today with the dual expertise in sex equity and computer education required to promote computer equity at the local level. This becomes especially significant in view of the anti-equity and anti-computer attitudes among educators that must be changed before computer equity improvement can take place. Changing attitudes cannot be accomplished through a book, although a book becomes extremely useful once more positive attitudes are forged. Face-to-face contact and interchange in a training environment are essential.

4. Implications for Action and Research

In view of the foregoing, we suggest that educational policy makers and specialists undertake the following steps. Each is based on an assumption that could certainly use further study and testing.

1. Sex equity specialists have a self-interest in promoting improved computer education: when educators have personal experience in using computers (for their own purposes as well as for their students), their attitude about the value of computer use for all students, including girls, becomes more positive. Positive teacher attitudes about computers are essential if they are to promote computer equity for girls.

2. Sex equity specialists who work with teachers would therefore be well advised to become reasonably computer-knowledgeable themselves in order to model the attitudes we would like to encourage.

3. Similarly, sex equity specialists would be well advised to work cooperatively with computer education specialists in delivering training or technical assistance intended to promote computer equity in schools.

4. Sex equity specialists need to be sensitive to how the strong desire in many schools to improve their computer education programs can swamp equity concerns. Equally strong reinforcement of the simultaneous need for equity must be present as a counterbalance.

NOTES

1. Kolata, Gina: "Equal Time for Women" in Discover, January 1984, pp. 24-7.

2. Gilliland, Kay: "EQUALS -- Computers in Education" in Math/Science Network Broadcast, vol. 2 no. 1, Fall 1981.

3. Lipkin, J., and Martin-McCormick, L.: "Microcomputers in the Classroom: Are Girls Getting an Even Break?" Project on Equal Education Rights (PEER), Washington DC, 1983; currently in draft form.

4. Anderson, Ronald E., Welch, Wayne W., and Harris, Linda J.: "Inequities in Opportunities for Computer Literacy" in The Computing Teacher, April 1984, pp. 10-12. The chart is from this article.

5. "APS Computer Education Pilot Project Evaluation; Report #2: Implementation." Albuquerque Public Schools, Division of Instructional Research, Testing, and Evaluation. December 1984, pp. 39-40.

6. Ibid., p. 36.

7. Miura, Irene and Hess, Robert D.: "Sex Differences in Computer Access, Interest, and Usage." Paper presented at the American Psychological Association annual meeting, Anaheim, CA August 1983.

8. Sanders, Jo Shuchat: "Making the Computer Neuter" to be published in The Computing Teacher, April 1985.

9. Sanders, ibid.

10. Mellor, Earl F.: "Investigating the Difference in Weekly Earnings of Women and Men" in Monthly Labor Review, June 1984, pp. 17-28.

11. Sanders, Jo Shuchat: "The Computer: Male, Female, or Androgynous? in The Computing Teacher, April 1984, pp. 31-4.

12. The causes of the computer equity problem are discussed at greater length in two upcoming articles by Jo Sanders. The first is listed above in Note 8; the second will appear in the April issue of The American School Board Journal.